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December 7, 2011 *Also Sent Via E-mail*

Mr. Tom McCue
Siltronic Corporation
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Mr. Robert J. Wyatt
NW Natural
220 N.W. Second Avenue
Portland, OR 97209

Subject: Responses to DEQ's September 22nd Comments on the Revised Groundwater Source Control Interim Design Report, November 2011 Meeting Summaries, and DEQ's Decisions re: NW Natural's Proposed Source Control Design Framework

Dear Mr. McCue and Mr. Wyatt:

NW Natural submitted the Revised Groundwater Source Control Interim Design Report[1] (Revised Interim Design Report) in May 2011. The Revised Interim Design Report proposes designs for groundwater source control measures (SCMs) along the shoreline of the property owned by NW Natural (NW Natural Property, or the "Gasco" Site) and the northern portion of the adjoining property owned by Siltronic (i.e., shoreline segments 1 and 2). Groundwater source control along shoreline segments 1 and 2 involves preventing groundwater contamination in the Fill water-bearing zone (WBZ) and the Alluvium WBZ from migrating to the Willamette River, and not mobilizing manufactured gas plant (MGP) dense non-aqueous phase liquids (DNAPLs) where they occur along Segment 1. The principal elements of groundwater source control include; 1) a fully penetrating interceptor trench in the Fill WBZ; 2) a well-based hydraulic control and containment (HC&C) system for the Alluvium WBZ; 3) a groundwater and DNAPL monitoring plan to evaluate the performance of the Alluvium WBZ HC&C system; and 4) a water treatment system.

The DEQ provided comments on the Revised Interim Design Report in a letter dated September 22, 2011. The September 22nd letter also included DEQ's comments regarding the Segment 2 Field Test Report[2]. The Segment 2 Field Test Report presents the results of conducting a series of aquifer tests using pilot extraction wells located along the northern portion of the NW Natural Property shoreline.

Subsequent to receiving the September 22, 2011 letter, Siltronic and NW Natural submitted correspondence responding to DEQ's comments. In a letter dated September 30, 2011, Siltronic expressed concerns regarding DEQ's comments related to realigning the Fill WBZ interceptor trench towards the uplands, and pulling the construction schedule back so construction of the trench and HC&C

[1] Anchor QEA, LLC, 2011, "Draft Groundwater Source Control Final Design Report, NW Natural Gasco Site," May (received May 9th), a report prepared on behalf of NW Natural. DEQ recognizes the document as being the equivalent of the Revised Groundwater Source Control Interim Design Report and references the report in this letter accordingly.
[2] Anchor QEA, LLC, 2011, "Segment 2 Capture Zone Field Test Report – Gasco Sediments Site, Portland, Oregon," March (received March 16th), a report prepared for NW Natural.

system would occur within similar timeframes. The Revised Interim Design Report recommended constructing the Fill WBZ interceptor trench at the top of, or on the riverbank sometime during the in-water sediment project. NW Natural and Siltronic are conducting the in-water sediment project under U.S. Environmental Protection Agency (EPA) oversight.

NW Natural responded to DEQ's September 22nd comments in a letter dated November 4, 2011 with attachments. NW Natural's letter lays out a detailed proposal and framework for completing the design and construction of the Alluvium WBZ HC&C system. The proposed framework is intended to achieve construction and testing of the HC&C system during the summer of 2012 to support the in-water sediment project planning and design process. The November 4th letter also expresses NW Natural's concern regarding DEQ's comments on realigning the interceptor trench and reiterates the recommendation made in the Revised Interim Design Report for postponing construction of the Fill WBZ interceptor trench until sometime during the in-water sediment project. Prior to submitting the November 4th letter and on behalf of NW Natural, Anchor QEA, LLC presented an overview of the framework proposal to EPA and DEQ during a meeting on October 5, 2011.

NW Natural's response letter requested a decision from DEQ within two weeks of November 4th on the proposed framework for groundwater source control. During meetings convened on November 16, and November 21, 2011, DEQ provided Siltronic and NW Natural with decisions regarding each aspect of the proposed framework. Siltronic's concerns and DEQ's decision regarding the Fill WBZ interceptor trench were discussed on November 16th with Siltronic and NW Natural. Broader discussions on the proposed framework occurred on November 21st with Siltronic, NW Natural, and EPA participating. During the November 21st meeting, DEQ's decisions on framework topics other than the interceptor trench were discussed, including our conditions for accepting NW Natural's proposed framework for finalizing the design of, and constructing the Alluvium WBZ HC&C system. DEQ also indicated how the conditions for accepting the proposed framework should be incorporated into the design documents and/or the sequence of project work identified in the November 4th letter. In addition to the November 16th and 21st meetings, NW Natural, Siltronic, EPA, and DEQ held follow-up discussions on November 30, 2011 regarding DEQ's conditions related to estimating groundwater flux in the Fill WBZ, and evaluating available drawdown at extraction wells during long-term Alluvium WBZ HC&C system operation.

This letter provides an overview of NW Natural's November 4th framework and summarizes DEQ's understanding of the highlights of the November 16, November 21, and November 30, 2011 meetings. In addition, EPA's replies to NW Natural's responses to EPA's comments on the Revised Interim Design Report are attached.

For clarification, this letter documents DEQ's decisions regarding NW Natural's proposed framework discussed during the meetings on November 16th and 21st. The letter does not reply to NW Natural's November 4, 2011 responses to DEQ's September 22, 2011 general and specific comments. DEQ expects NW Natural to incorporate our comments into the design reports as indicated in the November 4th letter. DEQ will determine the adequacy of NW Natural's responses to our September 22nd comments based on our review of each submittal NW Natural will prepare under the November 4th final design process framework as modified by this letter.

NW NATURAL'S PROPOSED FRAMEWORK

As mentioned above, NW Natural's November 4, 2011 letter provides a detailed proposal and framework for completing the design and construction of the Alluvium WBZ HC&C system, including the water treatment system. The Fill WBZ interceptor trench represents the other principal SCM for achieving

groundwater source control. DEQ understands NW Natural considers the Fill WBZ interceptor trench design presented in the Revised Interim Design Report to be complete, and the November 4th framework proposes constructing the trench sometime during the in-water sediment project being overseen by EPA.

Regarding the Alluvium WBZ HC&C system, NW Natural proposes breaking three separate design documents out of the draft final groundwater SCMs design report discussed throughout DEQ's September 22, 2011 comments letter. The three HC&C system design documents and the sequencing of the design and construction elements include the following:

- A Revised Treatment System Design which finalizes the design of the water treatment system. Subsequent to DEQ review and acceptance, NW Natural intends to order treatment system equipment.
- A Revised Groundwater Source Control Construction Design Report (Construction Design Report) that finalizes the design of the Alluvial WBZ HC&C system and addresses DEQ's September 22nd comments related to design and construction of the HC&C system. After DEQ's review and approval, NW Natural proposes to construct the HC&C system, assess "baseline conditions," and conduct short-term testing of each extraction well and groups of wells collectively.
- Based on the results of short-term testing of the Alluvium WBZ HC&C system, NW Natural will prepare the Groundwater Source Control Operations and Performance Monitoring Design Report (Operations & Performance Monitoring Report) which will identify and determine HC&C system and DNAPL mobilization operational parameters and performance criteria, present a monitoring program for evaluating the performance and effectiveness of the HC&C system, and address DEQ's September 22nd comments on the same.

Subsequent to DEQ's approval of the Operations & Performance Monitoring Report, and with the final NPDES permit issued, the HC&C system could be started up for long-term operation.

DEQ DECISIONS

Fill WBZ Interceptor Trench

DEQ communicated our position on the Fill WBZ interceptor trench during the November 16th meeting. In short, DEQ did not approve postponing interceptor trench construction until sometime during the in-water sediment project because of the significant delay it would cause in initiating source control of the Fill WBZ. Furthermore, DEQ communicated our expectation that trench construction would begin within a reasonable timeframe after the HC&C system is in place. This letter claries that by "reasonable timeframe" DEQ means interceptor trench construction should be initiated within six months after the HC&C system is in place and the initial phase of testing is complete.

During the meeting DEQ acknowledged concerns shared by Siltronic and NW Natural regarding potential impacts to Siltronic's silicon wafer manufacturing operations (e.g., slope stability; vibrations), equipment access restrictions, trench design changes, and construction sequencing. However, DEQ determined trench construction should move forward along sections of shoreline where the potential to impact Siltronic operations is low, equipment access is available, and contaminant flux to the river is occurring. DEQ indicated sections of shoreline in the northern portion of the NW Natural Property and south of the FAMM leasehold to the Siltronic Property boundary meet these criteria. Furthermore, DEQ indicated the design presented in the Revised Interim Design Report accommodates this approach as the interceptor trench is intended to be constructed in sections.

Alluvial WBZ HC&C System

During the November 21, 2011 meeting DEQ accepted NW Natural's proposed framework for finalizing design and construction of the HC&C system subject to certain conditions. DEQ's position on NW Natural's proposed framework for designing and constructing the Alluvium WBZ HC&C system and the conditions for our acceptance are provided below. DEQ's conditions modify the November 4th framework NW Natural proposes for preparing design documents and sequencing construction, testing, and long-term operations primarily by expanding Step 2 (Submit Revised Design Report and Construct).

STEP 1 – Submit Revised Treatment System Design: DEQ's primary interests related to the water treatment system design involve: 1) identifying the parameters to be treated; 2) determining treatment objectives and discharge limits; and 3) identifying and quantifying influent treatment flow rates. Items #1 and #2 are being addressed through NW Natural's NPDES permit for the treatment system. Identifying and quantifying influent flow rates remain an outstanding issue.

As discussed during the November 21, 2011 meeting, the revised treatment system design should clearly identify the individual sources of water, including their associated range of flow rates, to be collected and routed to the treatment system. Quantifying flow rates for individual sources of water includes addressing DEQ's comments and questions regarding seasonal flux of groundwater through the fill WBZ. DEQ believes NW Natural should address the comments and questions by developing a technically supported estimate of groundwater flux through the Fill WBZ using a combination of information sources and analytical and numerical methods (e.g., MODFLOW model, calculations based on hydrogeologic conditions in the Fill WBZ, flow budget components, LNG basin data).

Estimates of groundwater flux through the Fill WBZ are also needed to support the Fill WBZ interceptor trench design. From the November 30th meeting, DEQ understands the MODFLOW simulations predict flows to the interceptor trench from the Fill WBZ to be in the range of 35 to 40 gallons per minute under the March 2000 modeling scenario. DEQ further understands the simulated estimate is considered by NW Natural to be reasonably high for planning purposes.

STEP 2.1 – Submit Revised Design Report: In addition to responding to DEQ's comments as indicated in NW Natural's November 4, 2011 letter, the Construction Design Report must address DEQ's general comment regarding "Long-Term Operations and Effectiveness of the Hydraulic Control and Containment System." Addressing this comment involves answering the question of whether the HC&C design will effectively perform under the long-term operating conditions imposed to prevent groundwater in the Alluvium WBZ from migrating to the river. From DEQ's standpoint, the issue resolves itself down to confirming the available drawdown for the upper Alluvium WBZ extraction wells is sufficient to sustain effective long-term system operations.

Based on DEQ's understanding of the November 30, 2011 meeting, NW Natural will be developing a technical approach to address this issue that includes, but is not necessarily limited to:

- Compiling available specific capacity and well efficiency information from aquifer tests conducted previously at existing pilot extraction wells to estimate a range of drawdowns for a single well;
- Conducting field work to collect additional data regarding the hydraulic properties of the Alluvium WBZ and improve extraction well designs and efficiencies, including:
  - Push-probe drilling at each extraction well location
  - Collecting samples of alluvium during drilling for grain-size analyses

  - Using grain-size analyses to estimate the hydraulic conductivity of the alluvium and determine extraction well designs
  - Drilling, constructing, and performing step-drawdown tests at selected extraction wells to obtain more representative values of hydraulic conductivity and well efficiency;
- Incorporating the information obtained from sieve tests and short-term wells tests into the site MODFLOW model to simulate operations of the HC&C system and assess drawdown in extraction wells; and
- Providing additional analysis and supporting documentation on the concept proposed for hydraulic containment of the deep alluvium (i.e., alluvium beneath the truncated deeper aquitard) by the upper alluvium extraction wells, including developing an approach for demonstrating and verifying this containment using field data collected from installations selected or installed for this purpose.

Many of the specific data collection items referenced above (e.g., push-probe drilling, sieve testing) are consistent with work NW Natural proposes in the November 4, 2011 letter.

DEQ understands NW Natural will submit the approach outlined above prior to, or along with the Construction Design Report. However, as discussed on November 30th the intent of developing the approach is to initiate the work items listed above as soon as practicable. For clarification, the findings of the work must be incorporated into the HC&C design before approval to construct the entire system is provided by DEQ.

Step 2.2 – Assess Baseline Conditions: DEQ expects evaluation of baseline groundwater and DNAPL conditions to be initiated as early as practicable in the sequence of project work intended to support the final design and construction of the Alluvium WBZ HC&C system. All project design steps would benefit from additional evaluations of baseline conditions, particularly with respect to DNAPL occurrence. Consequently DEQ expects findings of the work to be fully incorporated into the Alluvium HC&C system design prior to construction.

Based on discussions during the November 30th meeting, DEQ understands NW Natural will propose an approach to evaluate baseline groundwater and DNAPL conditions which will be initiated before submittal of the Construction Design Report, or during DEQ's review of the document. Consistent with Step 2.1, the intent of developing an approach for evaluating baseline conditions is to initiate the work as soon as practicable. DEQ further understands the approach will include proposals to evaluate baseline groundwater conditions by drilling, installing, and sampling additional monitoring wells and piezometers as indicated in NW Natural's November 4, 2011 letter. Baseline DNAPL conditions will be evaluated primarily through the use of Targost® equipment, but also through observations of DNAPL accumulation rates at individual installations consistent with the Revised Interim Design Report and DEQ's September 22nd comments.

Step 2.3 – Prepare "Initial Operation (Short-Term Testing) Work Plan:" In addition to the design documents identified in NW Natural's November 4, 2011 letter, a work plan should be prepared detailing the purpose and objectives of the initial testing phase of the Alluvium WBZ HC&C system. Of particular interest are the details of how data will be collected and used to address general and specific comments in DEQ's September 22, 2011 letter regarding identification and quantification of HC&C system operational parameters and performance criteria.

Step 2.4 – HC&C Construction: Subsequent to DEQ review and approval of the Construction Design Report, including the information described under steps 2.1 and 2.2 above, construction of the Alluvium WBZ HC&C system will be initiated.

STEP 3 – Initial Operation: The initial testing of the HC&C system will be conducted consistent with the DEQ-approved work plan.

STEP 4 and 5 – Based on the results of the initial phase of testing the Alluvium WBZ HC&C system, NW Natural will prepare the Operations & Performance Design Report as described in the November 4, 2011 letter. Subsequent to DEQ's review and approval of the report and issuance of the final NPDES permit, the HC&C system will be ready for full-time operation.

NW Natural should be advised that depending on the timeframe for completing the initial phase of HC&C system testing, data review and compilation, preparation of the Operations & Performance Design Report, and finalization of the NPDES permit for the water treatment system, the next step in the source control project could involve moving forward with construction of the Fill WBZ interceptor trench. For clarification, under any scenario construction of the interceptor trench should be initiated within six months of starting up the Alluvium WBZ HC&C system for long-term operation.

NEXT STEPS

NW Natural should submit a letter accepting DEQ's conditions for moving forward with the proposed framework within two weeks of receiving this letter. NW Natural's letter should also include a schedule for developing and submitting the technical approaches for completing the work described under Step 2.1 (Submit Revised Design Report) and Step 2.2 (Establish Baseline Conditions) above.

Please feel free to contact me with questions regarding this letter.

Sincerely,

Dana Bayuk
Project Manager
Portland Harbor Section

Attachment: EPA Reply to NW Natural's November 4th letter

Cc: Patty Dost, Pearl Legal Group
John Edwards, Anchor QEA
Ben Hung, Anchor QEA
Mike Riley, Anchor QEA
Rob Ede, Hahn & Associates
Myron Burr, Siltronic Corporation
Tom McCue, Siltronic Corporation
Alan Gladstone, Davis Rothwell Earle and Xochihua
James Peale, Maul Foster & Alongi, Inc.
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Christine Budai, Army Corps of Engineers
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Chip Humphrey, EPA
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Rich Muza, EPA
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Jim Anderson, NWR/PHS
Rob Burkhart, NWR/WQ
Tom Gainer, NWR/PHS
Henning Larsen, NWR/SRS
Matt McClincy, NWR/PHS
ECSI No. 84 File
ECSI No. 183 File